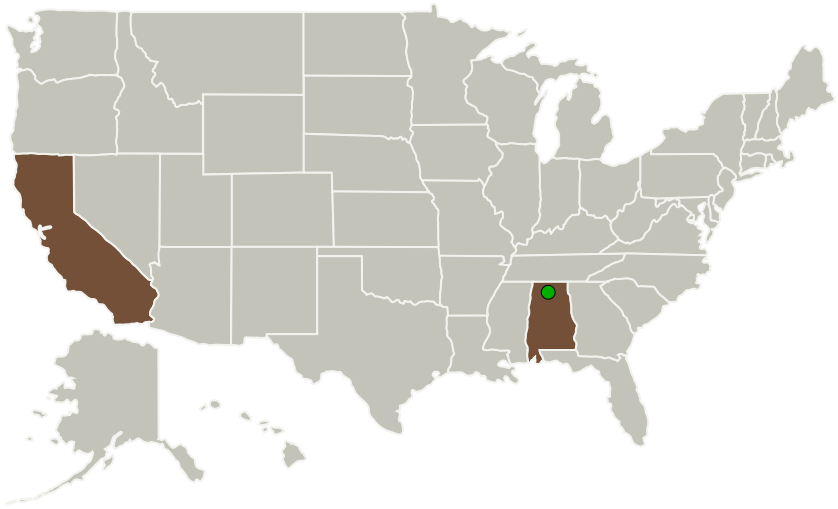
Novel, Functionally Graded Coating System for Reusable, Very High Temperature Applications, Phase I

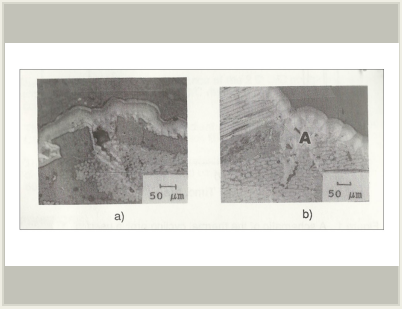
Completed Technology Project (2016 - 2016)

Project Introduction

This proposal addresses some of the most challenging materials issues with respect to multi-mission, very high temperature, up to 4000°F, applications. The very successful, record breaking, NASA led X-43A hypersonic flight proved the ability to use state of the art (SOTA) material/coating system for short duration, single mission, and very high temperature applications. The transition into multi-mission applications requires a total paradigm shift. Allcomp proposes an extremely innovative solution to this problem by using functionally graded (FGM) CVD coatings to alleviate interfacial shear stresses and greatly reduce transverse thermal cracking, which historically have plagued ceramic coatings applied to very low thermal expansion coefficient 2-D C-C composite substrates. The success of this Phase I will totally open new avenues in the area of high temperature materials. That, in turn, will enable NASA designers to implement hot structure solution in lieu of parasitic passive insulation system, resulting in significant weight reduction in future NASA Space Exploration vehicles, as well as a plethora of other applications.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Allcomp Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	California

Project Transitions

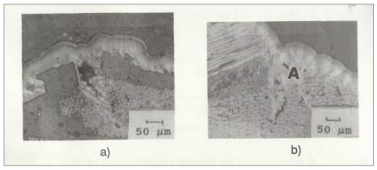
June 2016: Project Start

December 2016: Closed out

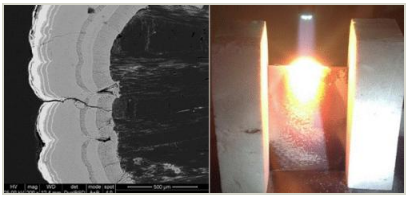
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140319)*

Images



Briefing Chart Image
Novel, Functionally Graded Coating System for Reusable, Very High Temperature Applications, Phase I
(https://techport.nasa.gov/image/132686)



Final Summary Chart Image
Novel, Functionally Graded Coating System for Reusable, Very High Temperature Applications, Phase I Project Image
(https://techport.nasa.gov/image/126598)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Allcomp Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

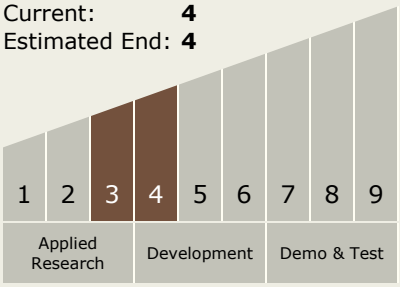
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Steve Jones

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Completed Technology Project (2016 - 2016)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.1 Lightweight Structural Materials

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System